

Science From Gateway With HERMES



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**HERMES: Heliophysics Environmental and
Radiation Monitoring Experiment Suite**

*Jim Spann, Program Scientist
NASA HQ*

Initial Gateway
Modules

Power and
Propulsion
Element (PPE)

Habitation and
Logistics
Outpost (HALO)

First Science Payloads:

- HERMES – NASA
- ERSA¹ – ESA
- IDA² – ESA/JAXA

Particles and fields
instrumentation for Radiation and
Space Weather studies

Of interest to ***SMD*** and ***HEOMD***
Exploration

¹ESA Radiation Sensor Array (ERSA)

²Internal Dosimeter Array (IDA)

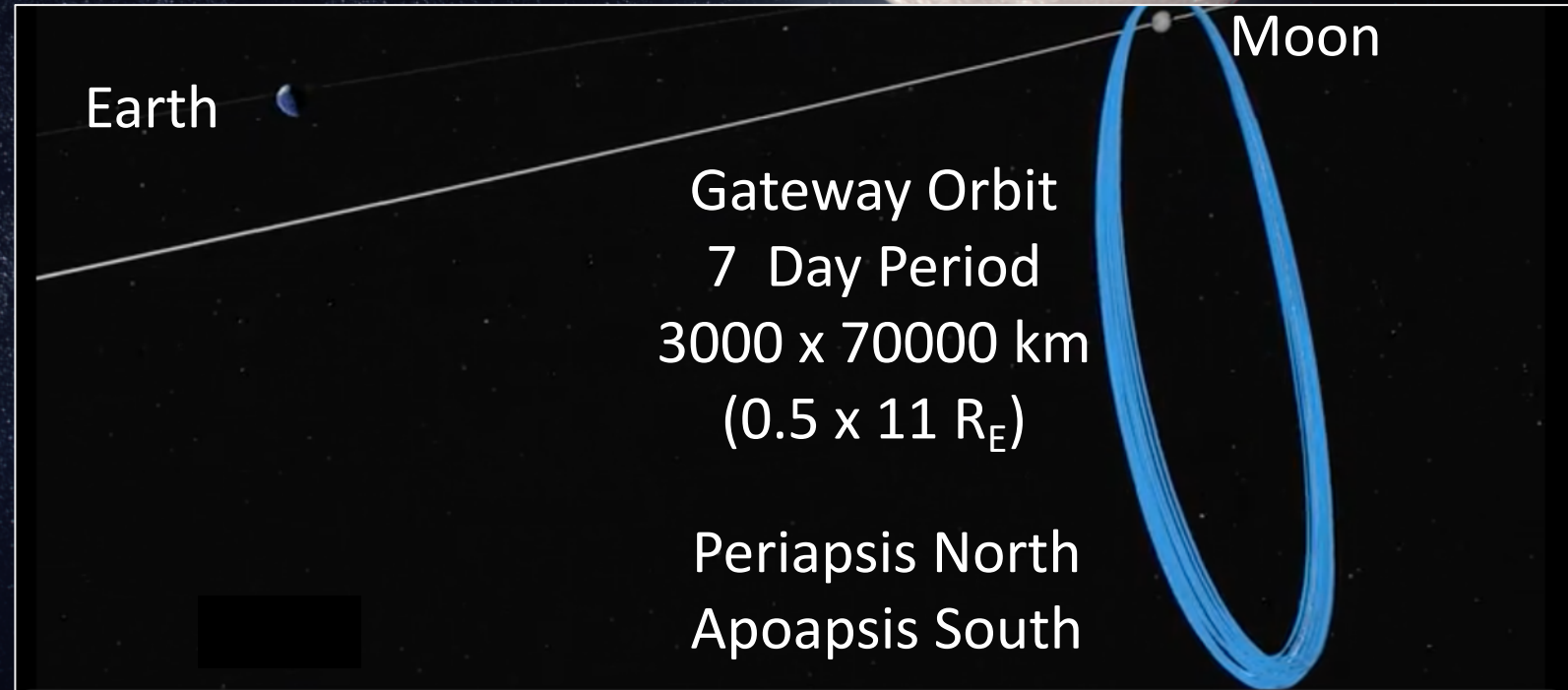
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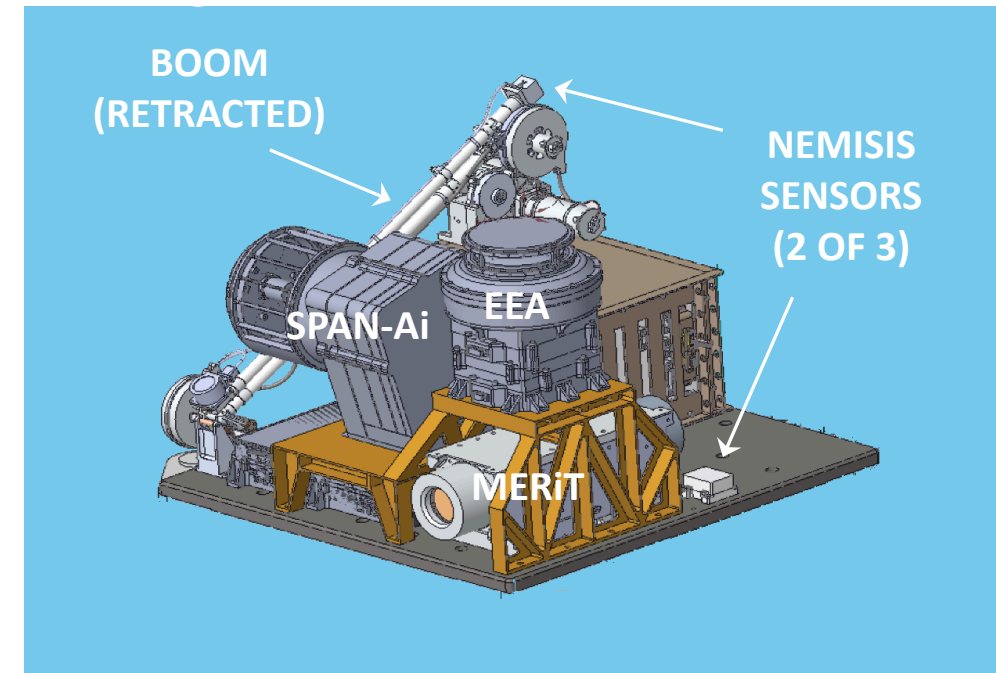
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- **HERMES - Heliophysics Environmental Radiation Monitoring Experiment Suite**
- **Composed of 3 particle instruments plus a set of magnetometers**
- **Capabilities are typical of in-situ space weather instruments**

| Instrument | Measurement | PI |
|--|--|--------------------------------------|
| EEA, Electron Spectrometer (electrons < 30 keV) | Electron Flux, Density, Speed, Temperature | D. Gershman, GSFC |
| SPAN-Ai, Ion Spectrometer (ions < 20 keV) | Ion Flux, Density, Speed, Temperature, M/Q Species | R. Livi, UC Berkeley |
| MERiT, Ion and Electron Telescope (energetic particles) | 0.3 – 9 MeV Electrons, 1 – 190 MeV Ions, Flux | S. Kanekal, GSFC |
| NEMISIS (MAG) (3 magnetometers) | Magnetic Field Vector | E. Zesta, GSFC M. Moldwin, U Mich |



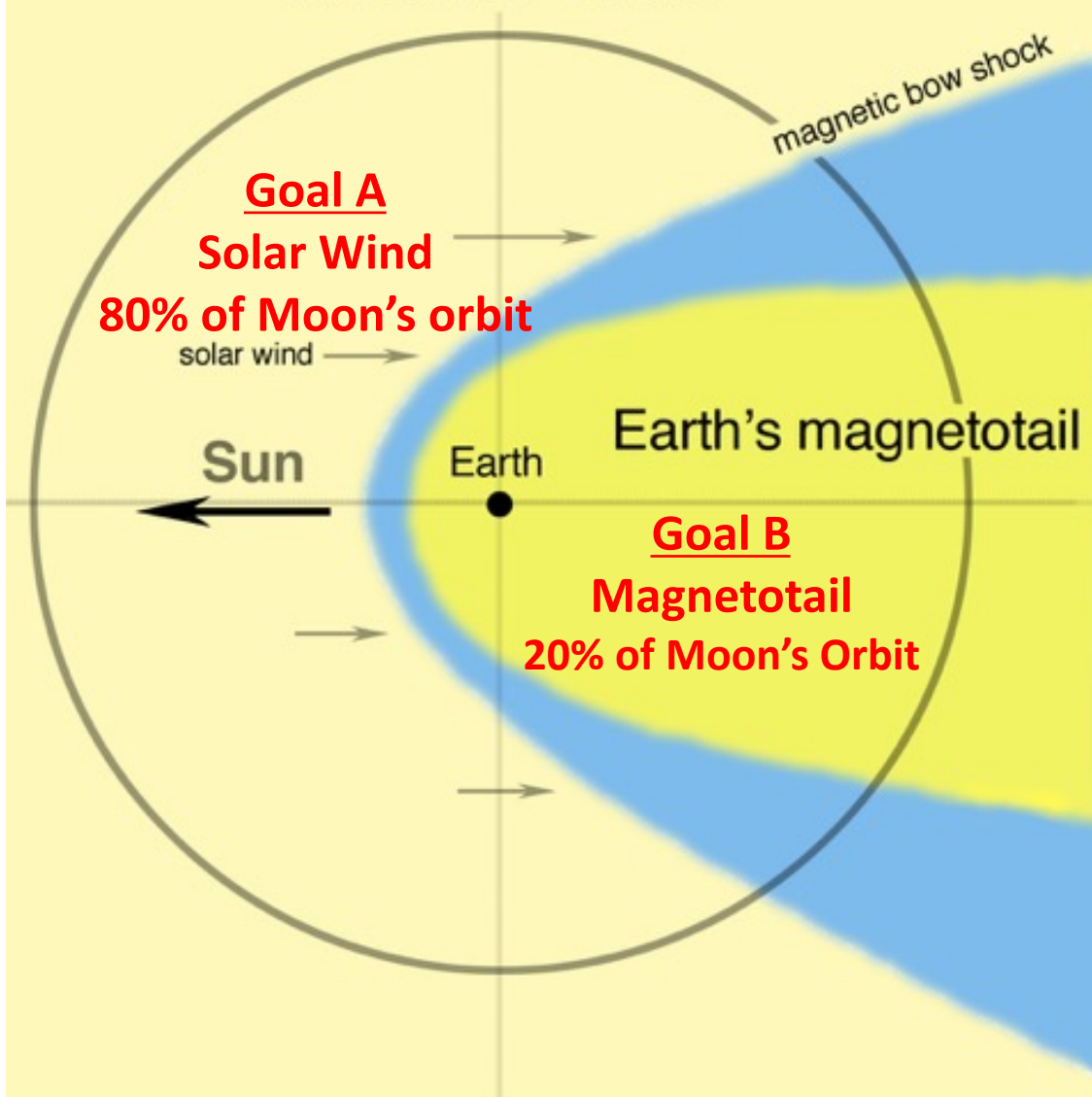
HERMES Payload

MASS < 25 kg

(X,Y,Z) < 0.5 × 0.5 × 0.5 m (Boom Stowed)

Magnetometer Boom Extends ~ 1 m

Moon's Orbit



HERMES Goals

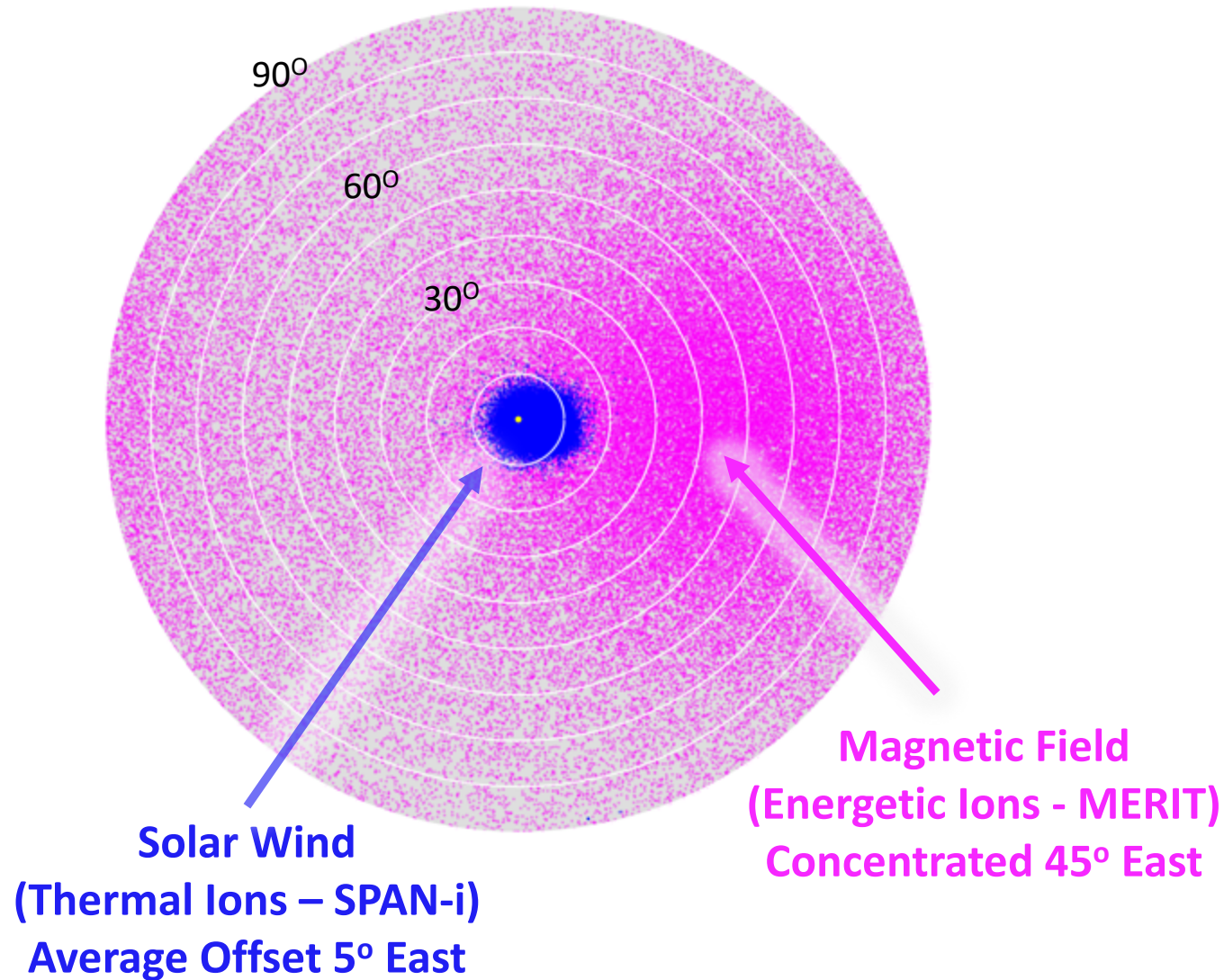
Goal A: Determine mechanisms of *solar wind* mass and energy transport

Goal B: Characterize energy, topology, and ion composition in the deep *magnetotail*

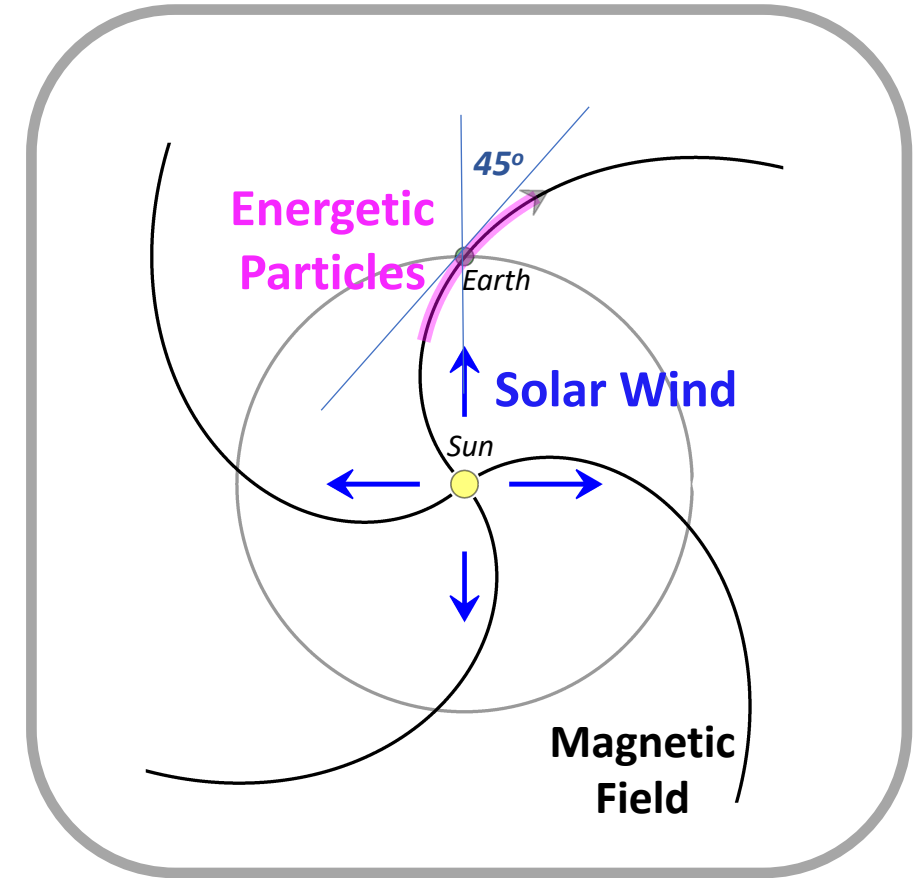
Goal C: Establish observational capabilities of an on-board *pathfinder payload* measuring local *space weather* to support deep-space and long-term human exploration

Science team to be augmented by international Interdisciplinary Science Teams (ROSES-20 amendment B18)
Selections pending

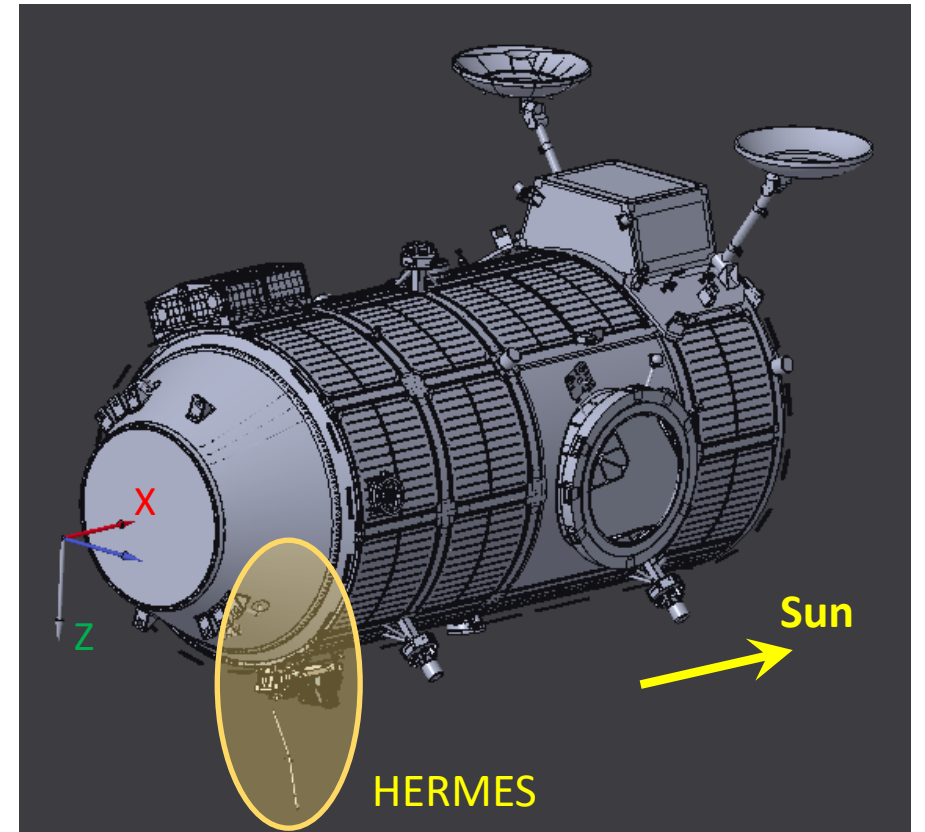
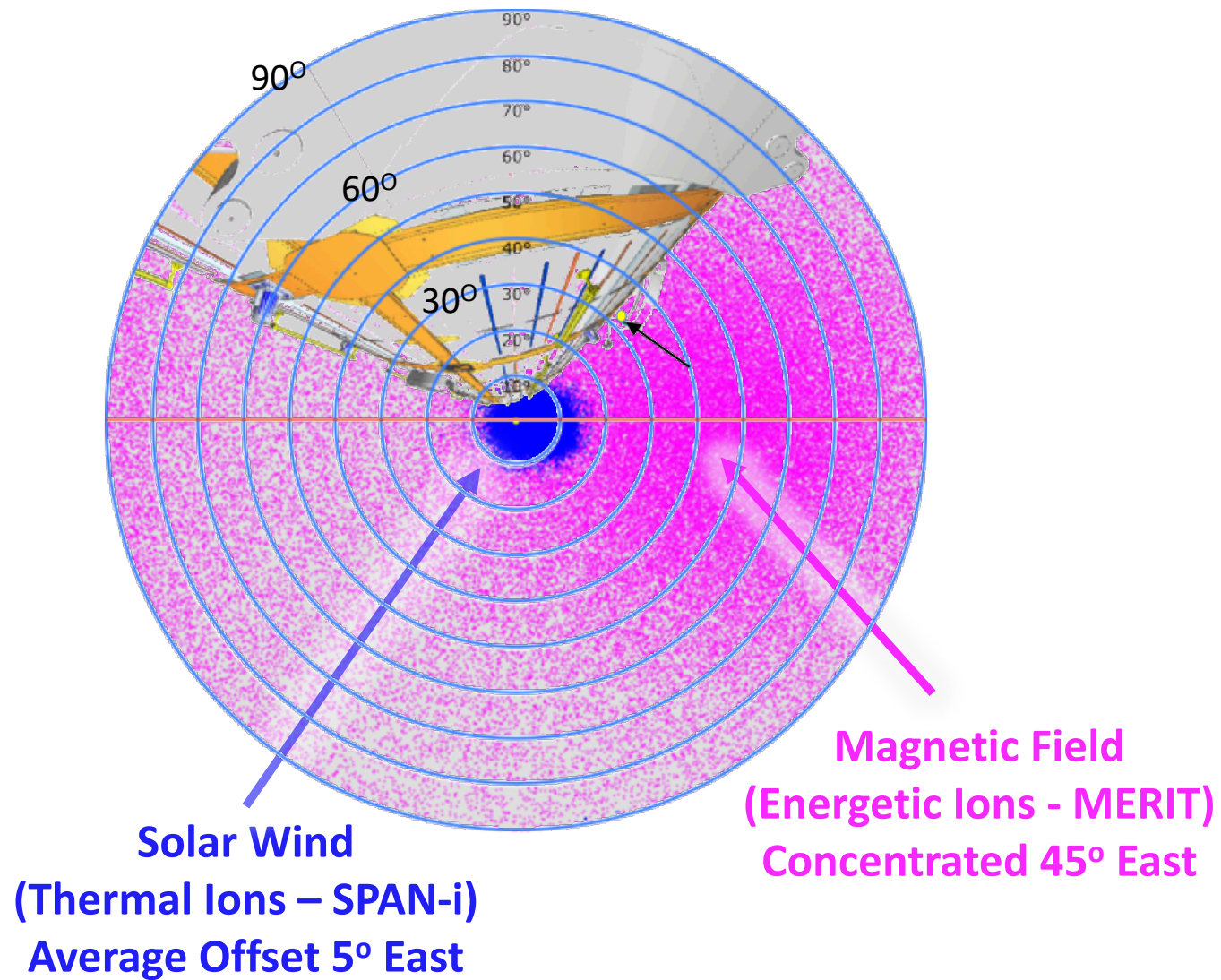
Solar Particle Directions when Sun Pointing (Based on 11 years data from L1)



Solar Particle Transport



HERMES View



HERMES on HALO



As an element to the Heliophysics System Observatory, HERMES offers several advantages for science

- **As a triad with the two THEMIS/ARTEMIS probes (in equatorial lunar orbit) HERMES will probe the smaller scale ($5 - 10 R_E$) structures (*e.g. the magnetopause, solar wind flux tubes, coronal mass ejections, shocks, flux ropes*)**
- **Along with L1 monitors, HERMES will probe larger-scale features**
- **Energetic particle telescope to detect Solar Particle Events at Earth/Moon**
- **Ion Mass Spectrometer will map the loss of ionospheric ions through the magnetotail**
- **$11 R_E$ lunar apoapsis provides for studies of the vertical extent of the magnetotail**

HERMES: Heliophysics Environmental Radiation Monitoring Experiment Suite

On track for May 2024 launch, 2025 lunar orbit, 2 years science operation in collaboration with HEAO to develop capabilities for real-time monitoring and space-weather alerts for deep-space missions (e.g. Mars), with compelling science investigations on behalf of SMD with participation of Gateway's international partners.

Hermes: Herald
of the Olympians
and *protector of
human heralds*

